

**Dr. Mary E. Clutter**

**Hatch Lecture**

**21<sup>st</sup> Century Agriculture**

**November 14, 2010**

**Association of Public and Land-  
Grant Universities**

# Topics

- Significant Events
- New Biology
- STEM Issues
- Toward 2050
- Challenges
- Partnerships

# Significant Events

USDA established by  
President Lincoln

Morrill I Land Grant Colleges

NIH established

Pound Report

CRGO  
established

NSF established

Recombinant  
DNA

Bankhead-Jones  
Act – Formula  
Funding

Morill II -  
HBCU

1862

1887

1890

1914

1935

1947

1950

1953

1958

1963

1972

1976

1978

1981

Hatch Act –  
Experiment Stations

Smith-Lever–  
Agriculture  
Extension Act  
(1<sup>st</sup> translational  
information)

Hybrid Corn  
(CT Exp. Station)

ARS established

Transposable  
Elements  
(jumping genes  
in corn)

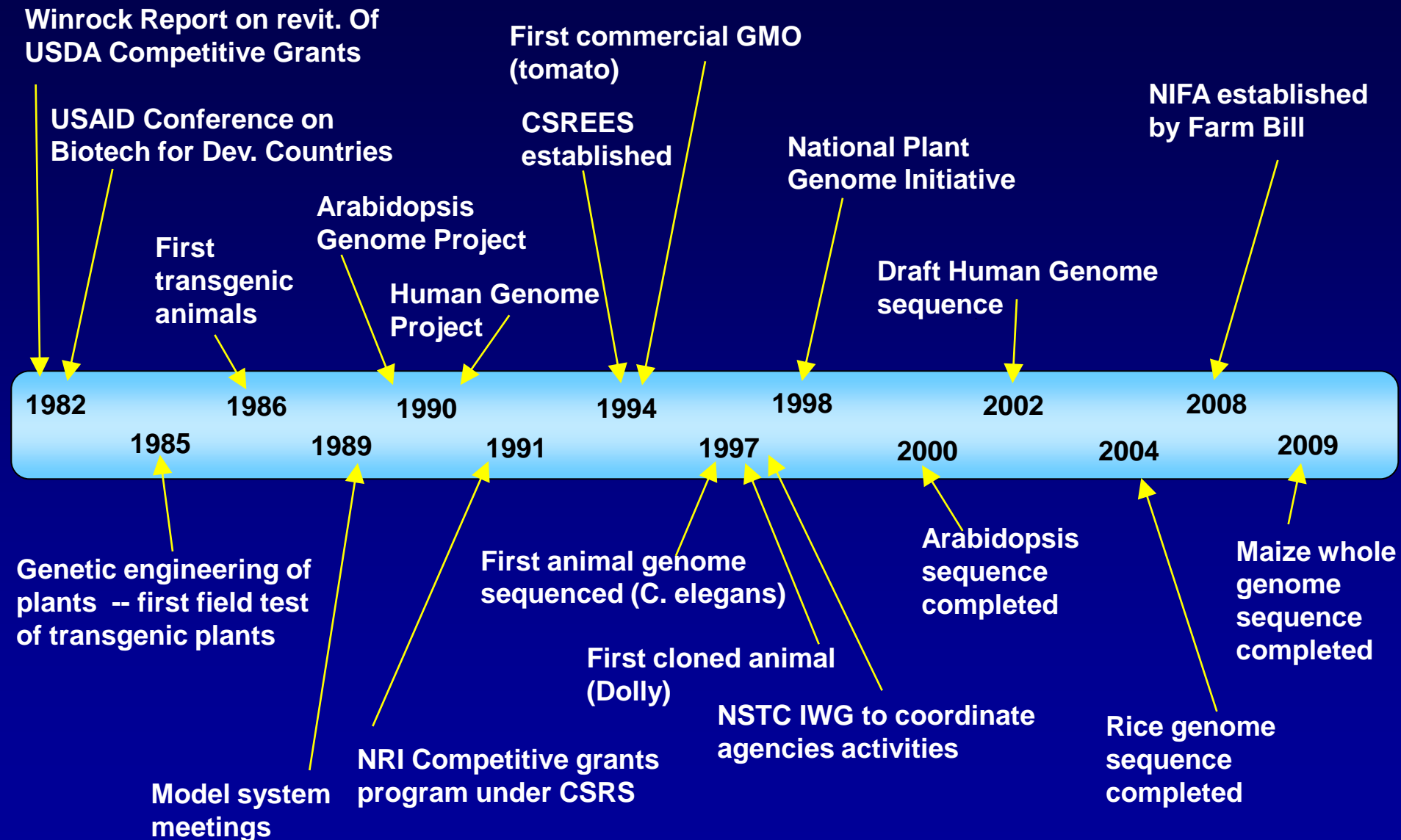
DNA structure  
elucidated

Green Revolution

Informal IWG  
(NSF, USDA, DOE)

OTA Report  
on impacts of  
Applied  
Genetics

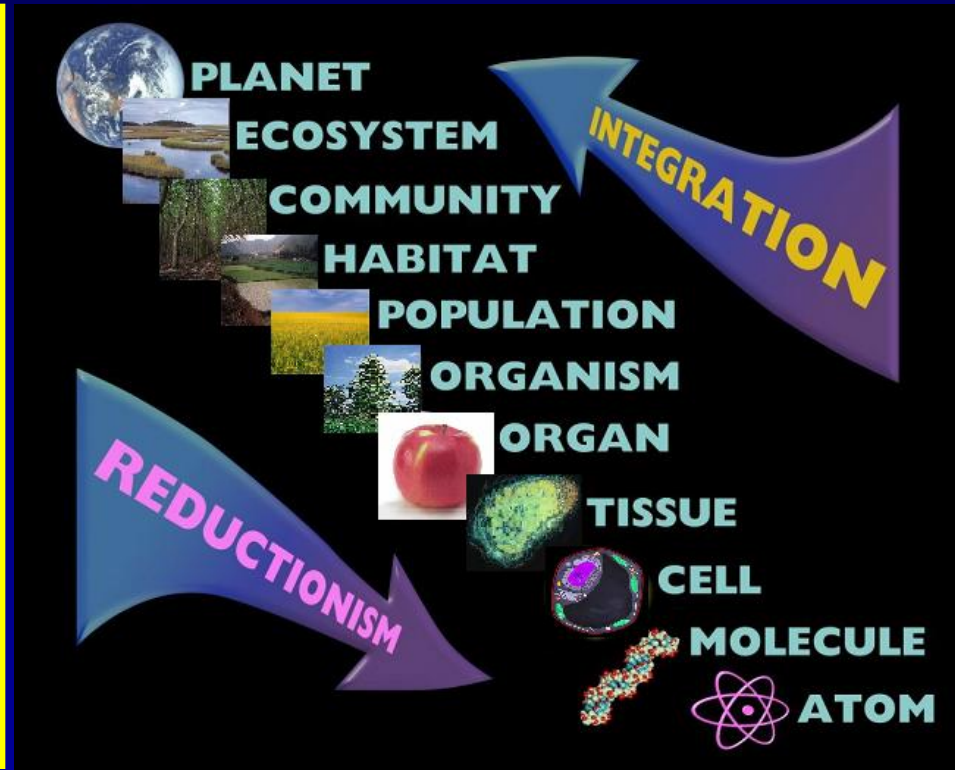
# Significant Events



# 21<sup>st</sup> Century Biology

## Omics and Beyond

- Multidisciplinary
- Multidimensional
- Cyberinfrastructure-enabled
- Education-oriented
- International



# DNA Sequencing Capability (per person)

- 1980: 0.1-1 kb per year
- 1985: 1-5 kb per year
- 1990: 25-50 kb per year
- 1996: 100-200 kb per year
- 2000: 500-1000 kb per year
- 2007: 30,000,000 -60,000,000 kb per year
- 2009: 100,000,000-1,000,000,000 kb per year
- 2011: ~4,000,000,000 kb per year?? Or more?

R. McCombie, CSHL

# Overcoming 20<sup>th</sup> Century Barriers

- Disciplinary
- Academic
- Government



# Current U.S. Population

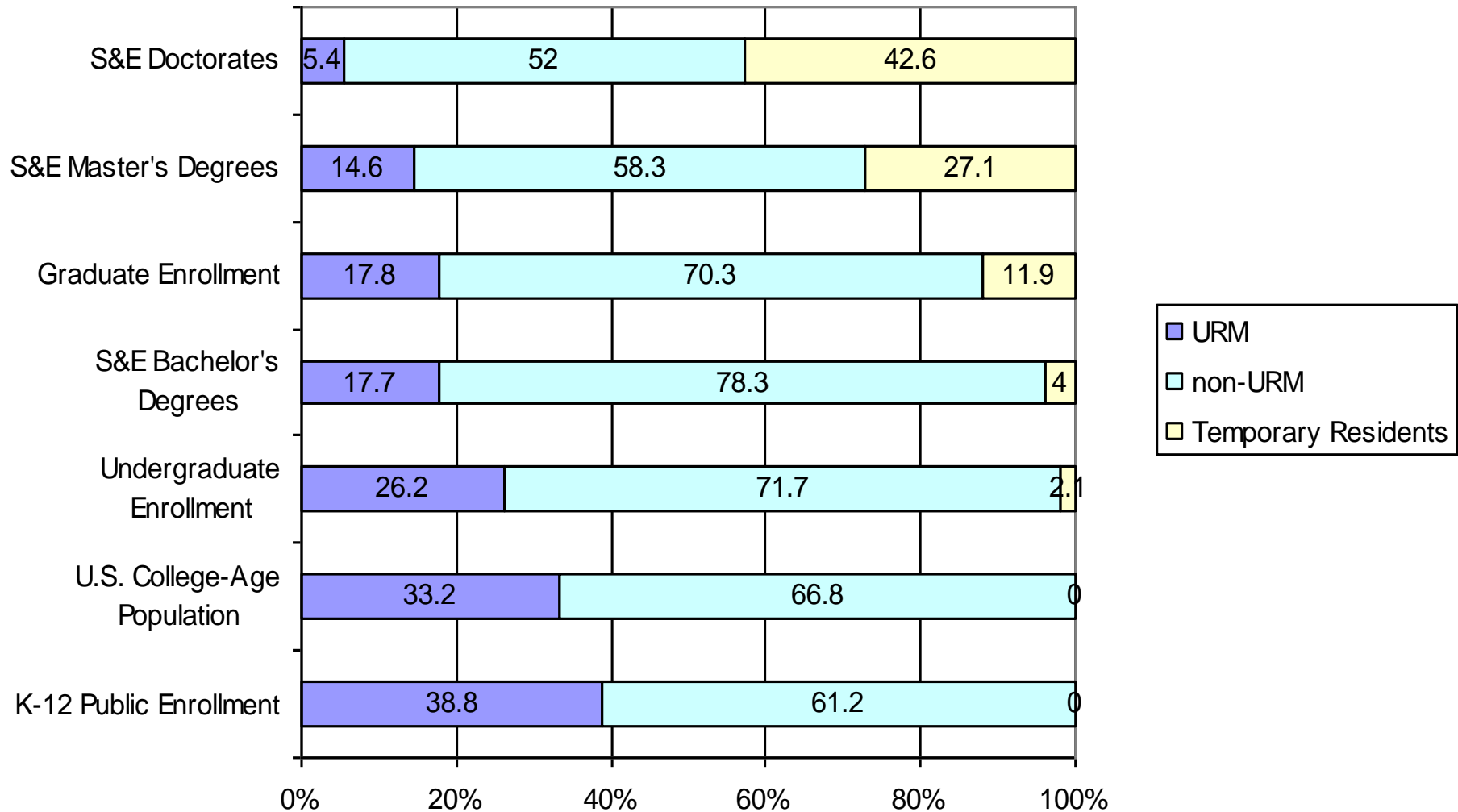
- Total = 301 million
- Minority Groups = 28.5%
- Women = 51.2%



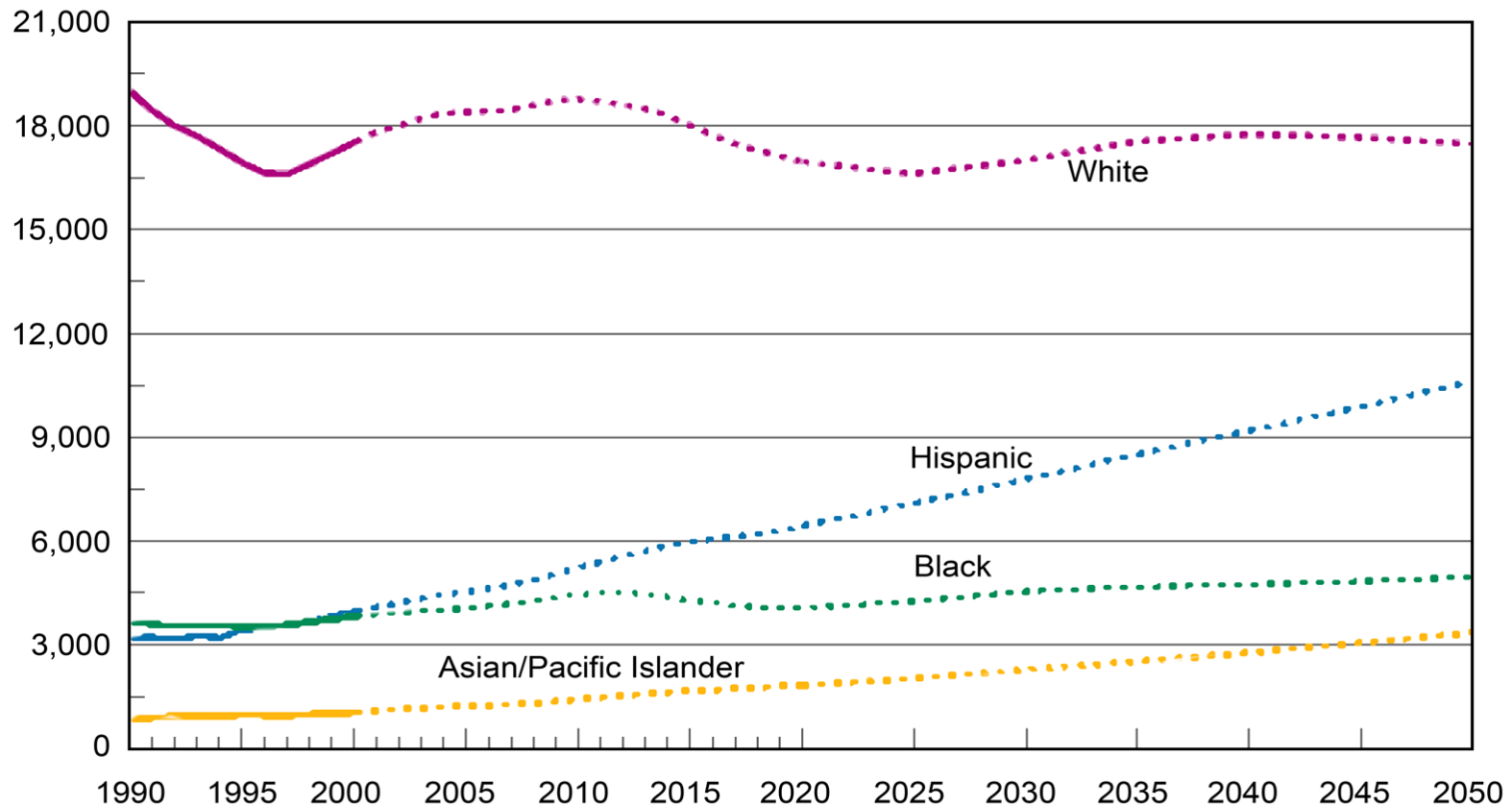
# U.S. POPULATION 2050

- Total projected = 420 million
- Minority Groups = 47.2 %
- Women = 51.1%

# Enrollment and Degrees, by Educational Level and Race/Ethnicity/Citizenship, 2007

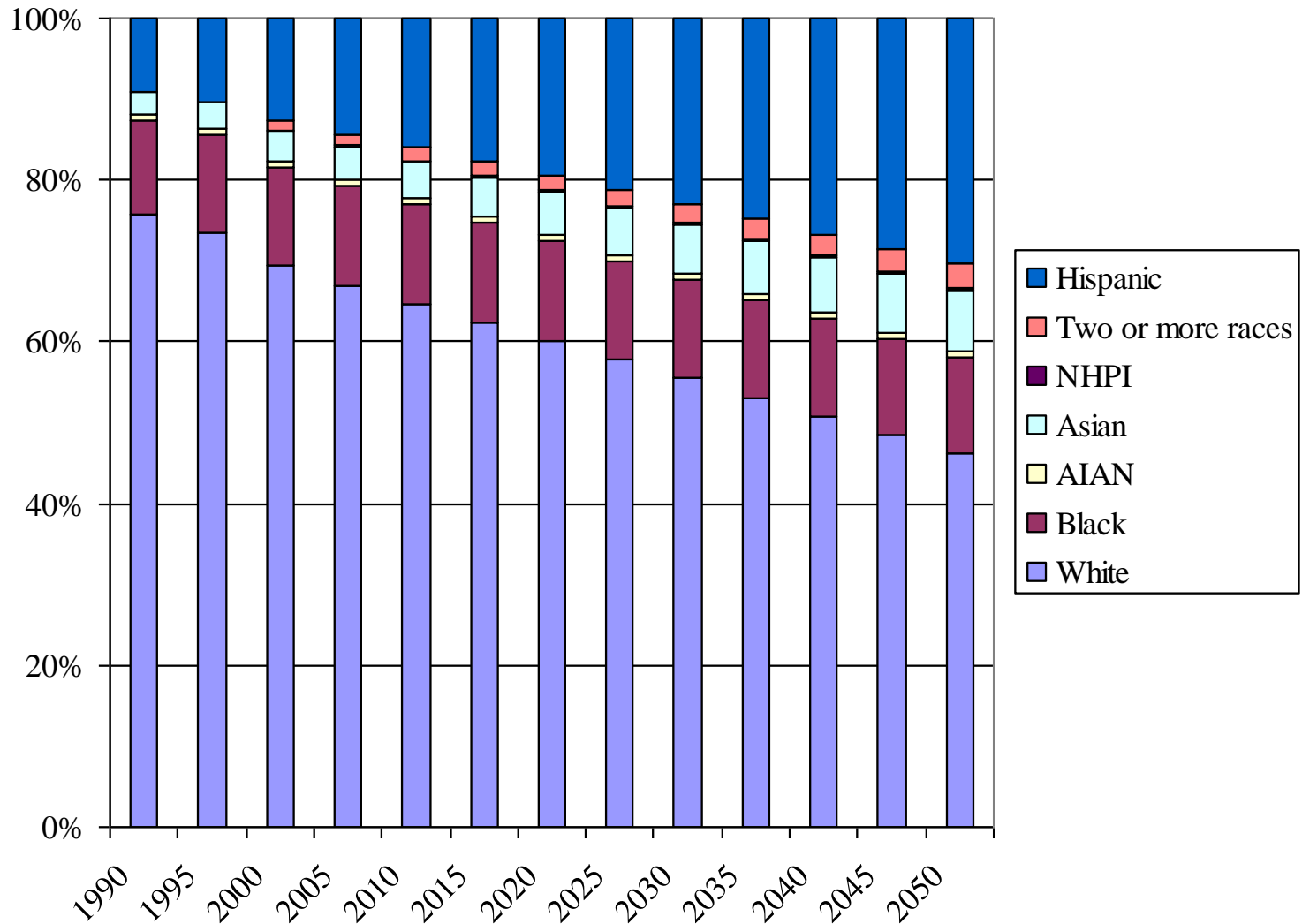


# Student Population Projected to be 50% URMS by 2050 U.S. Population 18-24 Years Old, by Race/Ethnicity: July 1990-99 & Projections to 2050



Source: National Science Foundation, *Women, Minorities and Persons with Disabilities in Science and Engineering*, 2004.

# U.S. population by race/ethnicity, 1990-2050 (2010-2050 projected)



# WORLD POPULATION

- Current = 6 Billion
- 2050 = 9 Billion

# **CHALLENGES**

- **Provide food for 9 billion people**
- **Attract students to STEM**
- **Reform education**
- **Increase diversity**
- **Develop leaders**
- **Sustain the environment**
- **Scientific/technical/political**

# Partnerships

Meeting these challenges will require the development of effective partnerships among universities and colleges, federal agencies, industry, professional societies, state governments, and international partners.